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Chapter 514  
Laws of the Hong Kong Special Administrative Region

The attached is a true copy of the Short-term Patent Application No. 03100284.2, which is still pending.

Dated this 4th day of August 2003.



  
(YIP CHIU YING RITA)  
Intellectual Property Examiner  
for Registrar of Patents

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Application No.

03100284.2

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**Request for Grant of a Short-Term Patent**

Patents Ordinance sections 113, 116, 125  
Patents (General) Rules sections 58, 74

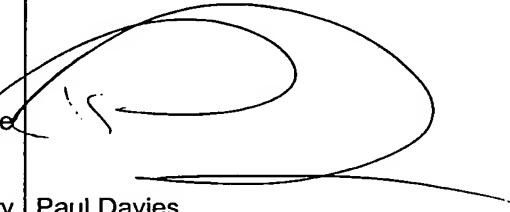
*(See the notes on the last page of this form)*

|   |  |   |
|---|--|---|
| <b>01 Your reference</b>                                  |  | 9869316 PRD   |
| <b>02 Applicant's details</b><br><i>(see note (4)(a))</i> |  | <p>Name<br/>(underline surname)<br/>Name in Chinese (if applicable)</p> <p>CHAN, Wing Kin<br/>陳永堅</p> <p>Address</p> <p>Block A-C, 4/F., Wing Hin Factory Building,<br/>31-33 Ng Fong Street,<br/>San Po Kong,<br/>Kowloon</p> <p>Telephone</p> <p>Fax</p> <p>Kind of incorporation<br/>Country of incorporation<br/>State of incorporation<br/>(if applicable)</p> |
| <b>03 Title of invention</b><br><i>(see note (4)(b))</i>  |  | <p>English</p> <p>COMBING DEVICE WITH ADJUSTABLE TEETH SPACING</p> <p>Chinese</p> <p>4</p>  |

|   |   |  |
|---|---|--|
| <b>04 Details of International Patent Classification</b><br><i>(see note (5))</i>   | IPC Code<br>A45D 2004   | IPC Edition No.<br>7                                     |
| <b>05 Use of micro-organisms</b><br><i>(tick the appropriate box)</i> <p>(a) Does the invention require the use of a micro-organism for its performance?</p> <p>(b) If you have ticked "Yes", please indicate whether the micro-organism is available to the public at the date of filing of the application; and</p> <p style="margin-left: 20px;">whether the micro-organism is described in the application or the specification of the patent in such a manner as to enable the invention to be performed by a person skilled in the art.</p> <p>(c) If you have ticked "No" in both boxes in (b), please give the following details:</p> <p>Name and address of the depositary institution where a culture of the micro-organism is deposited</p> <p>Date of deposit<br/> <i>(Day/Month/Year)</i></p> <p>Accession No. of the deposit<br/> <i>(section 73 and Schedule 1, Patents (General) Rules)</i></p> | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <b>06 Details of international application</b><br>If the short-term patent application is based on <p>(a) International Application No.</p> <p>(b) International Filing Date<br/> <i>(Day/Month/Year)</i></p> <p>(c) International Publication No.</p> <p>(d) International Publication Date<br/> <i>(Day/Month/Year)</i></p> <p>(e) Date of entry into the national phase in the People's Republic of China<br/> or<br/> Date of issuance of the National Application Notification by the State Intellectual Property Office<br/> <i>(tick the appropriate box and enter the date in the space provided)</i></p>   | <input type="checkbox"/>  | <i>(Day/Month/Year)</i>                                  |
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| <p>(f) Application No. of the Chinese patent application (if known)</p> <p><i>(section 125, Patents Ordinance and section 78, Patents (General) Rules)</i></p>   |   |   |  |  |   |   |                                  |           |            |                  |
|--|---|---|--|--|---|---|----------------------------------|-----------|------------|------------------|
| <p><b>07 Details of earlier application</b><br/>If the application is divided or derived from an earlier Hong Kong application</p>   |   | <p style="text-align: center;">Patents Ordinance</p> <p style="text-align: center;"><input type="checkbox"/> section 116      <input type="checkbox"/> section 55</p>   |  |  |   |   |                                  |           |            |                  |
| <p>(a) Section under which an earlier application is claimed (see note (6))<br/><i>(tick the appropriate box)</i></p> <p>(b) Earlier Application No.</p> <p>(c) Earlier Application Filing Date<br/><i>(Day/Month/Year)</i></p>                                |   |   |  |  |   |   |                                  |           |            |                  |
| <p><b>08 Details of the priority application</b><br/>If a statement of claim of priority under section 111, Patents Ordinance is made (sections 58(5)(c), 69, Patents (General) Rules)</p>   |   | <p><b>Statement</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Country</th> <th style="width: 33%;">Priority Application No.</th> <th style="width: 33%;">Priority Application Filing Date</th> </tr> </thead> <tbody> <tr> <td>Hong Kong</td> <td>02106602.5</td> <td>6 September 2002</td> </tr> </tbody> </table>           |  |  | Country                                     | Priority Application No.                  | Priority Application Filing Date | Hong Kong | 02106602.5 | 6 September 2002 |
| Country  | Priority Application No.                  | Priority Application Filing Date  |  |  |   |   |                                  |           |            |                  |
| Hong Kong  | 02106602.5                                | 6 September 2002  |  |  |   |   |                                  |           |            |                  |
| <p><b>09 Details of inventor</b><br/><i>(see note (4)(a))</i><br/><i>(see note (7))</i></p> <p>Name<br/><i>(underline surname)</i></p> <p>Name in Chinese (if applicable)</p> <p>Address</p>   |   | <p><u>CHAN, Wing Kin</u><br/>陳永堅</p> <p>Block A-C, 4/F., Wing Hin Factory Building,<br/>31-33 Ng Fong Street,<br/>San Po Kong,<br/>Kowloon</p>  |  |  |   |   |                                  |           |            |                  |
| <p><b>10 Non-prejudicial disclosure</b><br/>If the applicant is making a claim regarding non-prejudicial disclosure under section 109, Patents Ordinance, please provide a statement giving details relating to such disclosure.<br/><i>(see note (8))</i></p> |   | <p><b>Statement</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Name and place of the exhibition or meeting</th> <th style="width: 33%;">Opening date of the exhibition or meeting</th> <th style="width: 33%;">Date of first disclosure</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> |  |  | Name and place of the exhibition or meeting | Opening date of the exhibition or meeting | Date of first disclosure         |           |            |                  |
| Name and place of the exhibition or meeting  | Opening date of the exhibition or meeting | Date of first disclosure  |  |  |   |   |                                  |           |            |                  |
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| <p><b>11</b> If a request for deferral of grant under section 119, Patents Ordinance is required, please tick the box and enter the period of such deferral.<br/> <i>(the period of deferral should not exceed 12 months)</i><br/> <i>(if the box is not ticked, it will be taken that deferral of grant is not requested)</i></p> | <input checked="" type="checkbox"/> Request for deferral of grant up to <u>11/01/2004</u><br><i>(Day/Month/Year)</i> |
| <p><b>12</b> Enter the no. of sheets for any of the following documents you are filing with this form</p>  | <p style="text-align: right;">No. of sheets</p>  |
| <p>(a) Continuation sheet for the request</p>  |  |
| <p>(b) Description</p>   | <p>27 /</p>  |
| <p>(c) Claim(s)</p>  | <p>5 /</p>   |
| <p>(d) Drawing(s)</p>  | <p>13 /</p>  |
| <p>(e) Abstract (<i>in both English and Chinese</i>)</p>   | <p>1 (in English)</p>  |
| <p>(f) Priority document(s)</p>  |  |
| <p>(g) Translation of the priority document(s)</p>   |  |
| <p>(h) Search Report</p>   |  |
| <p>(i) Translation of the Search Report</p>  |  |
| <p>(j) In the case of an international application, copy of :</p>  |  |
| <p>(i) the international application as published by the International Bureau</p>  |  |
| <p>(ii) the international search report</p>  |  |
| <p>(iii) translation as published by the State Intellectual Property Office</p>  |  |
| <p>(iv) publication of information by the State Intellectual Property Office concerning the international application</p>  |  |
| <p>(k) Statement of inventorship on Patents Form P7 in accordance with section 113(2)(c), Patents Ordinance and section 65, Patents (General) Rules<br/> <i>(see note (7))</i></p>   | <p>3</p>   |
| <p>(l) Others (<i>please specify</i>)</p>  |  |

|   |  |
|---|--|
| <p><b>13 Name of agent (if you have one)</b></p> <p>Address for service in Hong Kong</p>  | <p>Deacons<br/>5<sup>th</sup> Floor, Alexandra House, Central<br/>Hong Kong</p> <p>Telephone 2825 9221 (Paul Davies)</p> <p>Fax 2810 0431</p> <p>Agent's code (if known)</p> |
| <p><b>14 I/We request the Registrar to grant a short-term patent.</b></p> <p>Signature</p>  | <p>Name of signatory Paul Davies</p> <p>Official capacity of signatory Patent Attorney</p> <p>Date (Day/Month/Year) 11/01/2003</p>   |

## **COMBING DEVICE WITH ADJUSTABLE TEETH SPACING**

### **FIELD OF INVENTION**

This invention relates generally to hair care means such as hair care attachments, devices and apparatuses and, more particularly, to hair care attachments, devices and apparatuses with means for combing hair, including combs and hairbrushes. More specifically, although of course not limiting thereto, this invention relates to a hair care device with combing means for coupling as an attachment to a hair care apparatus with an air blower. This invention also relates to a hair care apparatus with an air blower and a combing attachment with an adjustable spacing between the teeth.

### **BACKGROUND OF THE INVENTION**

Hair care devices with means for combing hair are widely used for general hair care such as combing, smoothing and tidying hair which has become messy. These types of hair care apparatuses are also used to perform hair styling as well as removing dirt and dis-entangling greasy and lumpy hair.

US Patent 5,729,907 describes such a hair care device as an attachment for a hair dryer with a comb and a heat transmissive plate for simultaneously drying and straightening one's hair.

US Patent 3,939,850 describes a combined hair comb and dryer device having baffles arranged to focus the warm hair moving through the device towards the hair as the hair is moving through the comb.

United Kingdom Publication No. GB 2,365,335 describes a hair care 5 apparatus with a combined hair dryer and comb for drying and straightening hair.

Hair care apparatuses and devices having means for combing hair, such as the ones described above, usually include a plurality of elongated teeth distributed at and overhanging the front portion of the main housing of the devices or apparatuses. In use, the elongated teeth are disposed intermediately between the 10 scalp and the handle portion of the main housing of the apparatuses or devices. Known hair care attachments, devices and apparatuses with such combing characteristics usually suffer from the common shortcoming that the teeth spacing between adjacent teeth is fixed which means hair of all thickness has to be treated with the same device, or, alternatively, or different attachments, devices or 15 apparatuses must be used in order to achieve optimal styling, caring or treatment to hair of different thickness or characteristics. Hence, it will be highly desirable if there can be provided attachments, devices or apparatuses with combing features having adjustable teeth spacing to suit individual need in order to provide optimal hair styling, caring or treatment without requiring separate devices for different 20 individuals. Such devices or apparatuses should be relatively simple and easy to use without requiring complicated or careful adjustment steps.

## **OBJECT OF THE INVENTION**

It is therefore an object of the present invention to provide hair care attachments, devices and apparatuses having combing means with adjustable teeth spacing to adapt to different hair thickness to cater for the hair quality of individuals. It is also an object of this invention to provide an attachment for hair care apparatuses or a hair care device or apparatus with combing means having adjustable teeth spacing as well as means for providing other hair care features such as hair blowing, straightening or styling.

## **SUMMARY OF THE INVENTION**

According to the present invention, there is provided a hair care device including a main housing, a first comb member, a second comb member, and teeth spacing adjusting means, each of said first and second comb members including a plurality of generally parallel and elongated teeth extending from a base portion, said first and second comb members being disposed on said main housing such that the elongated teeth on said first and second comb members are generally distributed along a first direction and the teeth on said first and said second comb members generally parallel, said first and said second comb members being translatable relative to each other along said first direction, wherein the relative translation of said first and second comb members along said first direction will cause the elongated teeth on one comb member to transverse the space between adjacent teeth on the other comb member to vary the effective teeth spacing of said

device, said teeth spacing adjusting means controls the relative translation between said first and second comb members.

Preferably, said teeth on said first and second comb members generally extend along a second direction, said second direction being non-parallel to said 5 first direction.

Preferably, said second direction being generally orthogonal to said first direction.

Preferably, said at least some of said teeth are tufts of bristles.

Preferably, said teeth spacing adjusting means include means to gradually 10 translate one of said comb members relative to the other comb member.

Preferably, the teeth spacings on said first and second comb members are generally equal.

Preferably, said device is a hair brush or hair brush attachment wherein said teeth are formed from bristles and said second direction along which said bristles 15 extend being radial from the longitudinal axis of said brush.

Preferably, said teeth spacing adjusting means includes a rotatable wheel with its plane of rotation disposed non-perpendicular to said first direction.

Preferably, said plane of rotation of said rotatable wheel being parallel to said first direction.

Preferably, a complete rotation of said rotatable wheel about said first direction as the axis of rotation will result in a cycle of reciprocating motion of one of said comb members along said first direction.

Preferably, said rotatable wheel is connected to a turning knob disposed outside said main housing via a shaft supported by said main housing.

Preferably, said gradual translation of said one of said comb members being driven by a screw-threaded rotary shaft, the longitudinal axis of said screw-threaded shaft being parallel to said first direction.

Preferably, said teeth spacing adjusting means further include means to maintain said one of said comb members at pre-determined positions along said first direction.

Preferably, said pre-determined positions correspond to discrete settings of the effective teeth spacing of said device.

Accordingly, in a first aspect, the invention consists in a hair care device comprising:

- a main housing;
- at least a first comb mounted on said housing;
- at least one second comb mounted on said housing on a generally parallel axis to said first comb and movable with respect to said first

comb along said parallel axis such that teeth on said second comb may move intermediate of said teeth on said first comb to reduce the teeth spacing in a transverse direction;

- actuating means to actuate movement of said second comb; and
- 5 - a pressure limiting mechanism to inhibit further movement of said second comb once a threshold pressure against further movement be reached caused by hair intermediate of the teeth of said first and second combs.

Preferably, said second comb member is bias towards a position in which  
10 teeth of said first and second combs are substantially in line with each other in said transverse direction.

Preferably, said actuating mechanism overcomes said bias to actuate movement of said second comb.

Preferably, said pressure limiting mechanism comprises a second biasing  
15 means acting on or within said actuating mechanism to allow further movement of said actuating mechanism without further movement of said second comb once a threshold of said second biasing means has been reached.

Preferably, said actuating mechanism includes a button actuatable by a user and an indirect connection between said button and said second comb whereby  
20 said indirect connection includes said second biasing means.

Thus, according to the present invention, there are provided hair care attachments, devices and apparatuses with the features set out above, wherein the teeth spacings on said first and second comb members are generally equal.

#### BRIEF DESCRIPTION OF THE DRAWINGS

5 Preferred embodiments of the present invention will be explained in further detail by way of example and with reference to the accompanying drawings, in which:-

Fig. 1 is a top plan view of a comb attachment embodying a first preferred embodiment of the present invention with the teeth of the first and second combing members overlapping.

10 Fig. 2 is a side view of the attachment of Fig. 1 viewing from the left side,

Fig. 3 is a side view of the attachment of Fig. 1 viewing from the right side,

Fig. 4 is a cross-sectional view of the attachment of Fig. 1 taken along the sectional line A-A,

15 Fig. 4A is an enlarged view of the circled portion of Fig. 4,

Fig. 4B is an enlarged view showing the cross-section, upper (left) and under (left) of the adjustment knob,

Fig. 5 is a cross-sectional view of the hair attachment of Fig. 1 taken along the sectional line B-B,

Fig. 5A is an enlarged view of the circled portion of Fig. 5.

Figs. 5B and 5C are partial cross-sectional views of the hair attachment of  
5 Fig. 1 taken respectively along the line C-C and D-D of Fig. 4,

Fig. 6 is a top plan view showing the comb sub-assembly detached from the rest of the attachment,

Fig. 6A is the front view of Fig. 1 with the comb members removed,

Fig. 7 illustrates the operation of the adjustment knob to vary the teeth  
10 spacing of the attachment of Fig. 1,

Fig. 7A is an enlarged view showing the circled portion of Fig. 7,

Fig. 8 is a top plan view of a comb attachment embodying a second preferred embodiment of the present invention,

Fig. 9 is a cross-sectional view of the comb attachment of Fig. 8 taken  
15 along the line A-A,

Fig. 9A is partial cross-section of the attachment of Fig. 8 taken along the line C-C,

Fig. 9B is a front view of the attachment of Fig. 8 with the comb sub-assembly removed,

Fig. 9C is an enlarged view of the circled portion showing in more detail the engagement means being connected with the lower portion of the pivotal cock,

5 Fig. 10 is a cross-sectional view of the attachment of Fig. 8 along the line B-B and Fig. 10A is an enlarged view of the circled portion,

Fig. 11 is a rear view of the comb attachment of Fig. 8 revealing in more detail the pivotal cock for moving the engagement tab,

10 Fig. 12 is a front view of a hair comb of a third embodiment of the present invention with the comb members removed,

Fig. 13 is a top view of the hair comb of Fig. 12 with the comb members intact,

Fig. 14 is a cross-sectional view of the hair comb of Fig. 13 taken along the line A-A of Fig. 12,

15 Fig. 15 is the side view of a fourth embodiment of the present invention configured as a hair comb,

Fig. 16 is a top view of the hair comb of Fig. 15,

Fig. 17 is a cross-sectional view of the hair comb of Fig. 15 exposing the more important features of the teeth adjustment means,

Fig. 17A is a cross-sectional view of a modified version of the hair comb of Fig. 15 exposing the fixed and movable comb members as well as the teeth adjusting means,

Fig. 18 is a cross-sectional view of a hairbrush showing a fifth preferred embodiment of the present invention,

Fig. 19 is a cross-sectional view of a hair brush showing a sixth preferred embodiment of the present invention,

Fig. 19A is a cross-sectional view taken along the line A-A of Fig. 19,

Fig. 20A is a front elevation of a hair care apparatus in accordance with a yet further embodiment of the invention,

Fig. 20B is a side elevation of the apparatus of Fig. 20A,

Fig. 20C is a cross-sectional end elevation through the axis A-A on Fig. 20A,

Fig. 20D is a cross-sectional front elevation of the apparatus of Fig. 20A,

Fig. 20E is a cross-sectional end elevation on axis B-B from Fig. 20D,

Fig. 20F is an end elevation of the apparatus of Fig. 20B,

Fig. 21A is a front elevation of a yet further embodiment of the apparatus,

Fig. 21B is a side elevation of the apparatus of Fig. 21A,

Fig. 21C is a partial cross-sectional elevation on axis A-A from Fig. 21A,

Fig. 21D is a partial cross-section on axis B-B on Fig. 21B,

Fig. 21E is a cross-sectional end elevation on axis C-C from Fig. 21C,

5 Fig. 22A is a front cross-sectional elevation of a yet further embodiment of  
the apparatus,

Fig. 22B is a side cross-sectional elevation of the apparatus of Fig. 22A,

Fig. 22C is an end elevation of the apparatus of Fig. 22B,

Fig. 22D is a cross-sectional end elevation of the apparatus of Fig. 22A

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

10 Referring to Figs. 1 to 7A, there is shown a first preferred embodiment of a hair care device of the present invention configured as a comb attachment which can be used with, for example, a hair-dryer or a hair blower. The comb attachment 1 includes a main housing 10 and a comb sub-assembly 20. The comb sub-assembly includes a first comb member 30, a second comb member 40 and teeth 15 width adjustment means 50. Each of the first comb member 30 and the second comb member 40 includes a plurality of elongated teeth 31, 41 extending from a base portion 32, 42.

The elongated teeth 31, 41 on the same comb member are generally parallel to each other with spacing 33, 43 separating adjacent elongated teeth and defining

the pitch of the corresponding comb member. The teeth spacings or the pitch 33, 43 between adjacent elongated teeth on the same comb member are preferably substantially identical.

In addition, the teeth on the same comb member preferably have the same 5 teeth width so that teeth of the same width are regularly distributed along the length of the base portion of the respective comb members.

The elongated teeth 31, 41 are preferably rigid or semi-rigid and made of, for example, plastics, metal, bakelite, bone or the like. Of course, the elongated teeth can also be made of a flexible material such as soft plastics. Where the 10 elongated teeth are made of plastics or metal, the elongated teeth and the corresponding base portion can be integrally made from plastics by moulding or from metal by stamping or pressing.

As a variation, the elongated teeth can also be formed by tufts of bristles which are mounted on the base portion of the comb members as holders of the 15 bristles. The first and the second comb members are mounted on the front portion of the main housing 10 so that the comb members 30, 40 are relatively movable in order to change the effective teeth spacing of the comb attachment. This will assist to provide, for example, optimal teeth spacing for hair of corresponding specific thickness.

20 Since the hair being combed will have to pass through the effective teeth spacing of the comb attachment 1, in order to perform appropriate combing, the

optimal teeth spacing should be adjustable so that it is neither too wide to allow too many hair to pass through a single pitch at the same time nor too narrow which makes the comb difficult to move through the hair.

In order to adjust the effective teeth spacing or pitch, the first 30 and the 5 second 40 comb members of the present embodiment are disposed in a relatively translatable configuration so that the elongated teeth of one comb member (the “first comb member”) can be moved towards and away from the teeth member of the other comb member (the “second comb member”) in order to cover a portion of the spacing between adjacent teeth of the second comb member. As a result of the 10 relative movements between the first comb member 30 and the second comb member 40, part of the teeth spacing on the first, movable, comb member 30 is in turn covered by the elongated teeth on the second, fixed, comb member 40, therefore changing the overall effective teeth spacing 34 of the comb attachment, as illustrated in Fig. 7A.

15 For the avoidance of doubt, throughout this description, the effective teeth spacing means the spacing between adjacent elongated teeth minus the spacing being covered by the teeth on another comb member.

Since the teeth pitches as defined by adjacent teeth on the same comb member are generally parallel to each other, it is preferred that the adjusted teeth 20 spacings are also generally parallel to each other and also generally parallel to the elongated teeth of the comb members. As such, it is preferred that the comb

members are relatively movable along a first direction so that the elongated teeth on the moving comb member will remain parallel to that of the other comb members during the movements, although at a different level.

In general, the first direction will be at an angle or inclination to the orientation or lengthwise axis of the elongated teeth, which is along a second direction, so that the effective teeth spacing 34 can be conveniently adjusted. In the present preferred embodiments, the comb members are arranged so that the orientation of the elongated teeth is generally orthogonal to the direction of relative movements between the comb members. Thus, the first and the second directions in this embodiment are generally orthogonal and the effective teeth spacing is adjusted by relative movements of the comb members transversal to the second direction. Of course, the first and second direction can be non-orthogonal and can incline at an appropriate angle.

To provide further convenience, the adjustable comb sub-assembly is mounted on a head portion 11 which is detachable from the main housing 10. As can be seen from Fig. 3, a latching means 12 is provided on the head portion 11 to facilitate detachability between the comb sub-assembly and the main housing.

Turning more particularly to Figs. 4 to 7A, the teeth spacing adjustment means and its operation will be explained in further details.

Referring more specifically to Figs. 4 to 5C, the second comb member 40 is fixedly connected to the main housing 10 or, more specifically, to the head portion

11 of the main housing 10 with the teeth generally extending along the second direction from the base portion 42. The head portion 11 of the main housing is also substantially rigid and includes a top, a bottom, sideguards and a front aperture exposing the comb teeth. The sideguards 111, 112 together form a bracket 5 enclosing the teeth members and extend beyond the tip of the comb teeth to keep away hair outside the region being combed from entering the toothed regions. The first, movable, comb member 30 is supported by the second comb member 40 in a movable manner by supporting arrangements 13 which are shown in more detail in Fig. 5A.

10       The supporting arrangement 13 includes a rivet 131 which connects the first and the second comb members by its stem and traps the comb members by its heads. In order that the first comb member 30 can be movable along the second direction, an elliptical aperture with an opening slightly larger than the diameter of the rivet stem is formed on the first comb member 30. The elliptical aperture is 15 sized so that the first comb member 30 can be translatable along the first direction while being retained by the rivet head.

20       A separator which is a washer 132 in the present example is placed between the comb members to reduce contact area and therefore friction. To adjust the range of movement and to avoid the rivet from clamping directly on the first comb member, a metal liner 133 is introduced to surround the portion of this stem above the plane of the second comb member 40. This metal liner 133 trims the space between the rivet stem and the aperture on the first comb member for an

appropriate range of translation along the first direction, as well as elevating the head of the rivet above the base portion of the first comb member 30.

In order to move and also to control the gradual movement of the first comb member 30, the first comb member 30 is connected to a teeth spacing adjustment means 50 which includes a movement mechanism. The movement mechanism includes a rotary member having a circular head 51 and a screw-threaded shaft portion 52. The shaft portion 52 is rotatably supported on the left sideguard 111 of the main housing.

To restrict the longitudinal movement of the rotary member relative to the sideguard 111, a retention member which is a clip 53, preferably engaging on a circular groove on the shaft 52, is disposed adjacent to the sideguard of the head portion 11. A nut 54 which is engaged on the threaded portion of a shaft 52 is engaged with an indentation formed on the base portion 32 of the first comb member 30. The engagement between the indentation and the nut 54 is preferably in a close-fitted manner so that any longitudinal translation of the nut 54 along the first direction as a result of the rotation of the circular head 51 of the rotary member will result in transactional movement of the first comb member along the first direction.

In order to restrict further, unwanted, movements of the movable comb member 30 once a preferred teeth spacing has been selected and set, corresponding holding means are formed on the underside of the rotary adjustment knob 51 and

the outside of the sideguard 111. This holding means 510 includes a small dome-shaped indentation 511 formed on the underside of the rotary adjustment knob 51 for engagement with a correspondingly shaped and positioned stud 512 on the outside of the sideguard 111. The holding means 510 can be released from 5 engagement by pulling the rotary adjustment knob 51 away from the sideguard 111 or by depressing the sideguard 111 carrying the rotary member towards the other sideguard 112. The residual resilience of the substantially rigid head portion will then allow this dis-engagement of the holding means.

In order to allow the first comb member to be retained in a plurality of pre-  
10 determined positions corresponding to pre-determined effective teeth spacings, a plurality of holding indentations 511 are distributed on the underside of the rotary knob 51 for engagement with the stud 512.

Turning now to the operation of the teeth spacing adjustment means, when the rotary head is rotated, the threaded portion of the shaft 52 will also rotate,  
15 thereby causing the nut 54 to move towards or away from the rotary head 51 along the threaded shaft. Because of the engagement of the nut 54 with the indentation on the base portion 32 of the first comb member, the first comb member 30 will be brought to move along the longitudinal direction of the shaft 52. Therefore, by disposing the shaft 52 along the first direction, the first comb member can be  
20 moved along the first direction with the elongated teeth on the first comb member moving generally parallelly to the elongated teeth on the second comb member.

As the present comb attachment is designed for coupled operation with an hair-dryer or hair blower, one end 13 of the main housing is generally tubular and shaped corresponding to the barrel exit of a compatible hair-dryer or hair blower. In order to divert excessive warm or hot air to move away from the hair if the air 5 outlet of the attachment is blocked while combing, downstream air diverting outlets 14 are disposed adjacent to the head portion of the main housing so that the warm or hot air can be diverted to avoid overheating the scalp.

Referring to Figs. 8 to 11, there is shown a second preferred embodiment of a comb attachment of the present invention. Similar to the first preferred 10 embodiment, this comb attachment 2 also includes a main housing 10 and a comb sub-assembly 20. The comb sub-assembly includes a first comb member 30, a second comb member 40 and teeth width adjustment means 60. Each of the first comb member 30 and the second comb member 40 includes a plurality of elongated teeth 31, 41 extending from a base portion 32, 42. In general, the two 15 embodiments are identical except for the teeth width adjustment means 60. Similar to the first preferred embodiment, the movable first comb member is riveted to the fixed, second, comb member 40 with an elliptical aperture formed on the first comb member 30 with the same peripheral parts.

Instead of a rotary means for adjusting the effective teeth spacing, teeth 20 width spacing adjustment means 60 in the present embodiment includes a push-tab arrangement more particularly shown in Figs. 9, 9B, 9C and 10. The push-tab arrangement includes a push-tab member 61 disposed on the top surface of the

head portion 11 and an engagement member with an engagement protrusion 66 disposed underneath the top surface for selection of pitch width by a user. The engagement member includes a pair of bifurcated legs extending through the head portion 11. An elongated hook with a protrusion 66 extending towards the underside of the head portion 11 is formed at the end of each of the bifurcated legs. The underside of the push-tab member is connected to a fork member 62 for driving engagement with a pivotal cock member 63 which is in turn connected to the first comb member 30. The cock member 63 is pivotally mounted about an axis 64 on the head portion of the main housing 10 and includes a first end in driving engagement with the first comb member 30 and a second end in driving engagement with the fork member 62 of the push-tab 61. Holding means are correspondingly formed on the top portion of the main housing and the underside of the push-tab 61. In the present embodiment, the holding means include a plurality of indentations 65 and the engagement members. The indentations 65 are formed on the main housing and arranged corresponding to discrete effective teeth spacing. The engagement means includes at least a protrusion 66 for engaging with the selected indentation in order to lock the first comb member 30 at a pre-determined position corresponding to a pre-determined effective teeth spacing. Thus, a user can select one of the discrete effective teeth spacings by selecting the positions “1”, “2”, “3” and “4” to conveniently select the effective teeth spacing for hair caring. The selected position will be reasonably fixed by the engagement between the protrusion 66 with the corresponding indentation 65. This

engagement can be released by pushing the push-tab member 61 away from the selected position along the second direction and the resilience of the push-tab arrangement.

Turning now to the operation of the teeth spacing adjustment means, when 5 the push-tab is moved along the second direction, the fork member 62 disposed underneath the push-tab 61 will drive the second end of the cock which causes a pivotal movement of the first end of the cock about the pivotal axis 64, thereby moving the first comb member 30 along the second direction to adjust the effective teeth spacing.

10 Referring to Figs. 12 to 14, there is shown a third preferred embodiment of the present invention configured as a comb 3. In general, the comb 3 includes also includes a main housing 10 and a comb sub-assembly 20. The comb sub-assembly includes a first comb member 30, a second comb member 40 and teeth width adjustment means 50. Each of the first comb member 30 and the second comb 15 member 40 includes a plurality of elongated teeth 31, 41 extending from a base portion 32, 42. In this preferred embodiment, the relative disposition of the comb members and the teeth spacing adjustment means 50 are generally identical to that of the first embodiment with appropriate corresponding modifications which are obvious to persons skilled in the art.

20 Referring to Figs. 15 to 17, there is shown a fourth preferred embodiment of the present invention configured as a comb 4 similar to that of the third

embodiment but employing the teeth spacing adjustment means 60 of the second preferred embodiment.

Referring to Fig. 17A, there is shown a modified version of the comb of Figs. 15 to 17. This specific embodiment is generally identical to the embodiment of Figs. 15 to 17 except that the movable comb member 30 is disposed between a left fixed comb member 401 and a right fixed comb member 402. The disposition of a movable comb member 30 between the two fixed comb members 401, 402 alleviates or relieves the stress on the movable comb member 30 since the stress is negotiated and shared firstly by the adjacent fixed comb members.

Referring to Fig. 18, there is shown a fifth preferred embodiment of the present invention configured as a hairbrush 5. In this preferred embodiment, the hairbrush includes a plurality of radially extending bristles which are organized into a first group of movable bristles 531 and a second group of fixed bristles 532. The movable bristles are connected to a shaft or base portion 540 which is movable along the longitudinal direction corresponding to the first direction in the earlier embodiments. The group of movable bristles 531 are translatable along the longitudinal axis (the "first direction") of the hairbrush by connection to the teeth width adjustment means similar to those described in the earlier preferred embodiments. In this specific embodiment, a rotary wheel 550 with a radial slot for engaging with a stud 560 connected to the shaft 540 is provided to move the second bristle group along the axial, or first direction are illustrated as an example.

Referring to Figs. 19 and 19A, there is shown a sixth preferred embodiment of the present invention also configured as a hairbrush 6 which includes a movable comb member 630 with teeth members 631 extending radially from the base portion 632 of the comb members. The hairbrush 6 also includes a fixed comb member 640 which are fixed to the housing 10 of the hairbrush and with teeth members 641 extending from the base portion 642 of the fixed comb member. In contrast to the hairbrush of Fig. 18, the teeth members 631 of the movable comb member 630 of this specific embodiment are disposed intermediate between a first 641A and a second 641B rows of teeth members extending radially from the base portion 642 of the fixed comb member. Similar to the embodiment of Fig. 17A, this sandwiching of the movable comb member between two rows of fixed teeth members alleviates or relieves the stress from the movable teeth members for more effective and more durable brushing.

A yet further embodiment of the invention is shown in Figs. 20A - 20F.  
15 This embodiment is directed to a hair care device in the form of a comb having a housing forming a handle 701 and a comb portion 702.

As seen in Fig. 20A, the comb portion may comprise at least a first comb 703 having teeth 704 connected to the handle 701 and a second comb 705 having teeth 706. In this particular form, a third comb 707 is also connected to the handle  
20 701 although it will be appreciated that this is not essential to the invention.

The second comb 705 is mounted on a substantially parallel axis to the first and third combs and moveable relative to both the first and third combs 703, 707 along that parallel axis. In this manner, the second comb 705 may reduce the effective spacing 708 between the teeth in a direction transverse to the axes on which the combs are mounted.

5 The arrangement of the combs may be seen in Fig. 20F whereby the central second comb 705 is moveable in a gap 709 between the first and third combs.

Movement of the second comb 705 is actuated by a user actuating a button 711 or 712. Two buttons are provided in this embodiment and actuation of either 10 will result in movement of the second comb 705. The use of two buttons on opposed sides of the handle is to accommodate the actuation when the comb is held in either the left or right hands of a user.

The actuating mechanism can be seen in more detail in Fig 20D. The button 712 is connected to a shaft 714 acting upon a cam 715. The shaft and cam 15 have cooperating surfaces such that depression of the button 712 and hence the shaft 714 will cause retraction of the member 716 carrying the cam surface 715.

It will be noted that the member 716 is not directly linked to the comb 705. Although a direct connection would cause the necessary movement of the comb 705, this embodiment does not seek to move and lock the comb 705 by a discrete 20 interval. Instead, actuation of the button 712 will cause continuous movement of the comb 705 and a user can dictate the resultant gap between the teeth of the

combs by control of the depth of depression of the button 712. The risk of direct connection is that a user may press too hard on the button 712 and catch hair in between the teeth causing pain or damaging the hair so caught.

To limit this effect, a pressure limiting mechanism is employed to limit the  
5 pressure applied by the teeth against the hair passing in between.

The pressure limiting mechanism may take a variety of forms and in this embodiment is incorporating as a biasing means within the actuating mechanism.

Referring again to Fig 20D, it can be seen that movement of the member  
716 away from the comb end of the device is transmitted through a second biasing  
10 means in the form of a compression spring 717 to a portion 719 that is in direct  
connection with the comb 705. In turn, the portion 719 in the form of a U shaped  
member is acting against the urging of a first biasing means 718 that seeks to  
return the comb 705 to the open position. In this embodiment, the first biasing  
means 718 is of lower compressive strength than the second biasing means 717.  
15 Hence, upon movement of the button 712, the member 716 and 717 will move  
substantially at the same time against the urging of the biasing means 718.  
However, should the user depress the button 712 to the extent that it may place too  
much pressure on hair between the teeth of the combs, further movement of the  
comb 705 is controlled by the threshold value of the compressive spring 717.

20 Referring to Fig. 20C, it can be seen that each button 711 and 712 actuates  
a separate shaft 714, 721 that act upon their own cam surfaces 715, 722. These cam

surfaces are angled in an opposed relationship on the end of the member 716 so as to act in the correct direction regardless of whether button 712 or 711 is depressed.

A yet further embodiment of the invention is shown in Fig.'s 21A – E. In this embodiment, the hair care device comprises a comb attached to a handle also employing heated air to the hair being drawn between the teeth of the comb. 5 Otherwise, the mechanism is similar with three sets of bristles or teeth 801, 802 and 803, extending from a handle portion 804. As with the previous embodiment, the middle row of teeth 802 are moveable with respect to the two outer rows.

Referring to Fig. 21D, it can be seen that the actuating mechanism 10 comprises a button 806 that in turn depresses a shaft 807 acting against an angled cam surface 808. In this instance depression of the button moves the cam surface towards the comb end of the device to urge the movable comb 802 away from the handle.

Transmission of the force on the comb 802 is against a first biasing means 15 811 seeking to return the comb to the widest teeth spacing. However, this transmission of force is through a second biasing means 812 that can again limit the pressure applied laterally to hair drawn through the comb. In effect, the comb 805 is balanced between the two compression springs 811 and 812. Provided the compressive strength of the first biasing means 811 is less than that of the second 20 biasing means 812, movement of the cam surface 808 will seek to move the comb 802 such that the teeth reduce the spacing between the teeth of the comb 805 and

the adjacent combs 801 and 803. Should the pressure applied to the hair be greater than the threshold value of the second biasing means 812, further movement of the button and the cam surface 808 will only cause compression of the spring 812 and not result in further movement of the comb 802.

5       A still yet further embodiment of the invention is shown in Fig.'s 22A-D in which the invention is provided in the form of a comb similar to that as shown in Fig 20A. The difference with this embodiment is in the actuating mechanism.

Actuation is obtained by sliding the button 902 with respect to the handle 901. As shown particularly in Fig. 22A, the movable comb 904 is movable 10 between the outer combs 903, 905 to reduce the teeth spacing. Retraction of the sliding button 902 away from the combs causes similar movement of the member 907. The comb 904 is connected directly to the distal portion 908 help between two biasing means 911 and 912.

Initial movement of the slide 902 is transmitted through the member 907 15 and the second biasing means 912 so as to cause movement of the portion 908 and the comb 904 against the action of the biasing means 911. As with the previous embodiments, the compressive strength of the first biasing means 911 is less than that of the second biasing means 912. However, should the pressure created 20 between the teeth by hair passing through the teeth exceed the threshold value of the second biasing means 912, further movement of the slide 902 causes compression of the spring 912 instead of further movement of the comb 904.

In the above description, the same numerals have been used to refer to parts which are common to the various embodiments without loss of generality.

While the present invention has been explained by reference to the preferred embodiments described above, it will be appreciated that the 5 embodiments are only examples provided to illustrate the present invention and are not meant to be restrictive on the scope and spirit of the present invention. This invention should be determined from the general principles and spirit of the invention as described above. In particular, variations or modifications which are obvious or trivial to persons skilled in the art, as well as improvements made on 10 the basis of the present invention, should be considered as falling within the scope and boundary of the present invention. Furthermore, while the present invention has been explained by reference to comb attachments, combs and hairbrushes, it should be appreciated that the invention can apply, whether with or without modification, to other hair care devices, attachments or apparatuses.

15

## CLAIMS

1. A hair care device including a main housing, a first comb member, a second comb member, and teeth spacing adjusting means, each of said first and second comb members including a plurality of generally parallel and elongated teeth extending from a base portion, said first and second comb members being disposed on said main housing such that the elongated teeth on said first and second comb members are generally distributed along a first direction and the teeth on said first and said second comb members generally parallel, said first and said second comb members being translatable relative to each other along said first direction, wherein the relative translation of said first and second comb members along said first direction will cause the elongated teeth on one comb member to transverse the space between adjacent teeth on the other comb member to vary the effective teeth spacing of said device, said teeth spacing adjusting means controls the relative translation between said first and second comb members.
2. A hair care device according to claim 1, wherein said teeth spacing adjusting means includes a rotatable wheel with its plane of rotation disposed non-perpendicular to said first direction.
3. A hair care device according to claim 2, wherein said plane of rotation of said rotatable wheel being parallel to said first direction.

4. A hair care device according to claim 2, wherein a complete rotation of said rotatable wheel about said first direction as the axis of rotation will result in a cycle of reciprocating motion of one of said comb members along said first direction.
5. A hair care device according to claim 2, wherein said rotatable wheel is connected to a turning knob disposed outside said main housing via a shaft supported by said main housing.
6. A hair care device according to claim 5, wherein said turning knob includes a screw-threaded shaft, the longitudinal axis of said shaft being parallel to said first direction.
7. A hair care device according to claim 1, wherein said teeth on said first and second comb members generally extend along a second direction, said second direction being non-parallel to said first direction.
8. A hair care device according to claim 7, wherein said second direction being generally orthogonal to said first direction.
9. A hair care device according to claim 1, wherein said at least some of said teeth are tufts of bristles.
10. A hair care device according to claim 1, wherein said teeth spacing adjusting means include means to gradually translate one of said comb members relative to the other comb member.

11. A hair care device according to claim 10, wherein said gradual translation of said one of said comb members being driven by a screw-threaded rotary shaft, the longitudinal axis of said screw-threaded shaft being parallel to said first direction.
- 5      12. A hair care device according to claim 11, wherein said one of said comb members being driven by said screw-threaded rotary shaft via a nut, said nut being rotatable about a plane which is generally orthogonal to said first direction.
- 10      13. A hair care device according to claim 10, wherein said teeth spacing adjusting means further include means to maintain said one of said comb members at pre-determined positions along said first direction.
14. A hair care device according to claim 13, wherein said pre-determined positions correspond to discrete settings of the effective teeth spacing of said device.
- 15      15. A hair care device according to claim 1, wherein the teeth spacings on said first and second comb members are generally equal.
16. A hair care device according to any of the claims 1 to 15, wherein said main housing include a hollow member with an air-inlet, an air-outlet, and a neck portion interconnecting said air-inlet and said air-outlet, said comb members being disposed at said air-outlet with said teeth pointing away from said air-outlet.

17. A hair care device according to claim 16, wherein said main housing includes means for coupling to the nozzle of a hair care apparatus with a blower.

18. A device according to claim 1, said device is a hair brush or hair brush attachment wherein said teeth are formed from bristles and said second direction along which said bristles extend being radial from the longitudinal axis of said brush.

5

19. A hair care apparatus including an air blower and a hair care device of any of the preceding claims.

20. A hair care device comprising:

10

- a main housing;
- at least a first comb mounted on said housing;
- at least one second comb mounted on said housing on a generally parallel axis to said first comb and movable with respect to said first comb along said parallel axis such that teeth on said second comb may move intermediate of said teeth on said first comb to reduce the teeth spacing in a transverse direction;
- actuating means to actuate movement of said second comb; and
- a pressure limiting mechanism to inhibit further movement of said second comb once a threshold pressure against further movement be reached caused by hair intermediate of the teeth of said first and second combs.

15

20

21. A hair care device as claimed in claim 20 wherein said second comb member is biased by a first biasing means towards a position in which teeth of said first and second combs are substantially in line with each other in said transverse direction.

5 22. A hair care device as claimed in claim 21 wherein said actuating mechanism overcomes said first biasing means to actuate movement of said second comb.

23. A hair care device as claimed in claim 22 wherein said pressure limiting mechanism comprises a second biasing means acting on or within said actuating mechanism to allow further movement of said actuating mechanism without further movement of said second comb once a threshold of said second biasing means has been reached.

10 24. A hair care device as claimed in claim 23 said actuating mechanism includes button actuatable by a user and an indirect connection between said button and said second comb whereby said indirect connection includes said second biasing means.

15

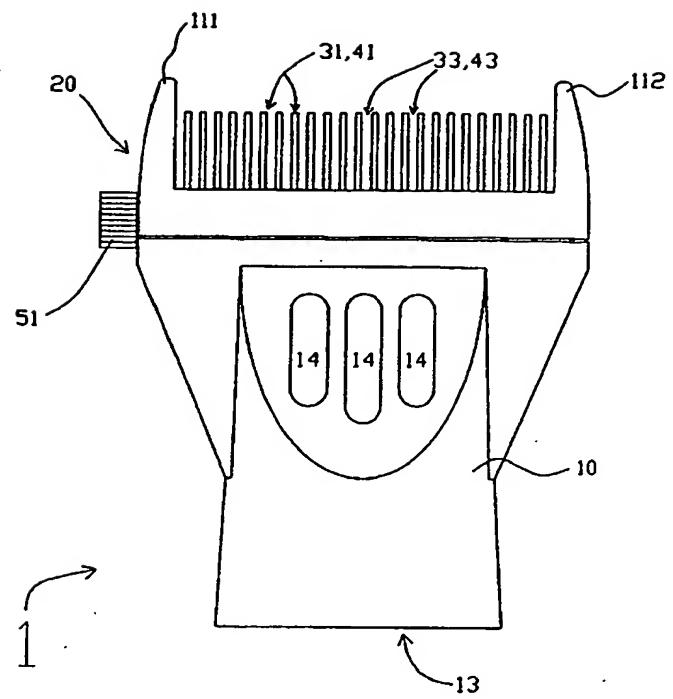


FIG. 1

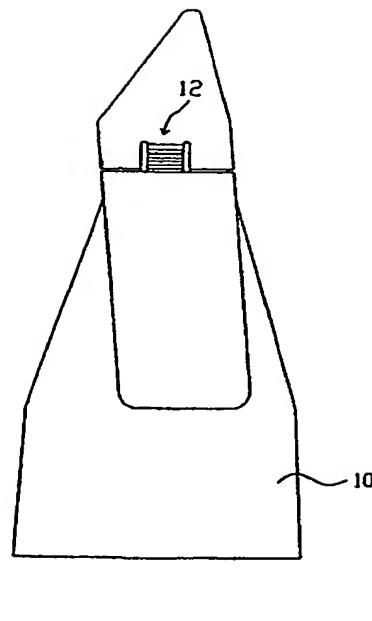


FIG. 3

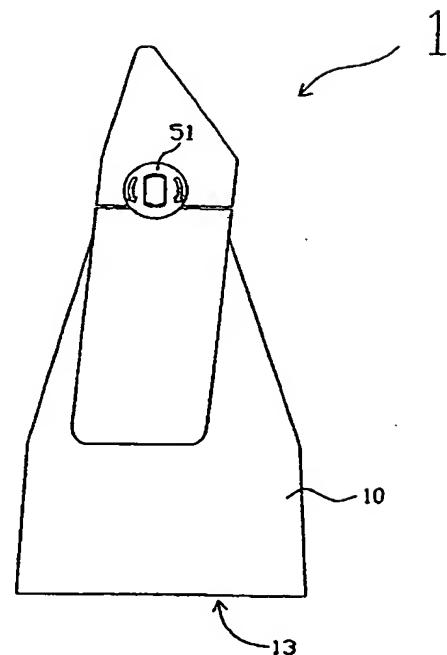
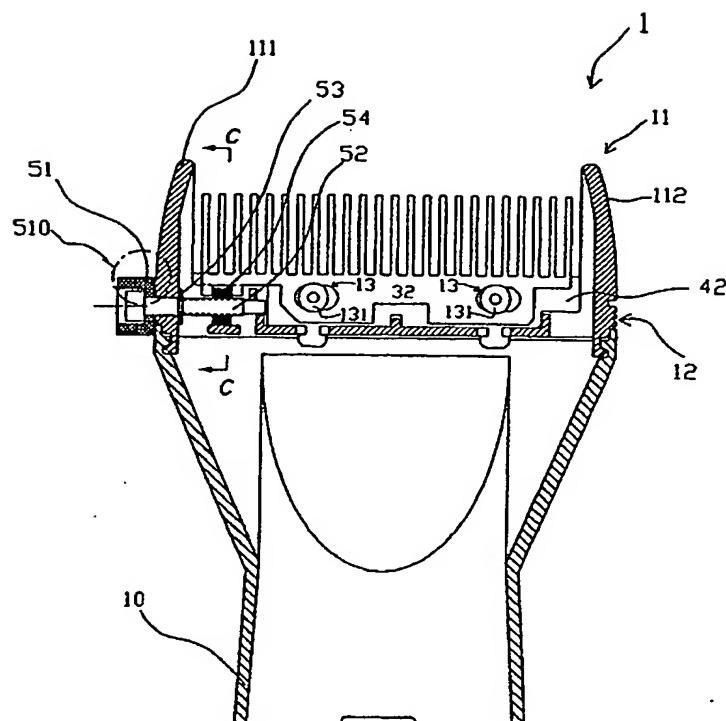


FIG. 2



SECTION A-A

FIG. 4

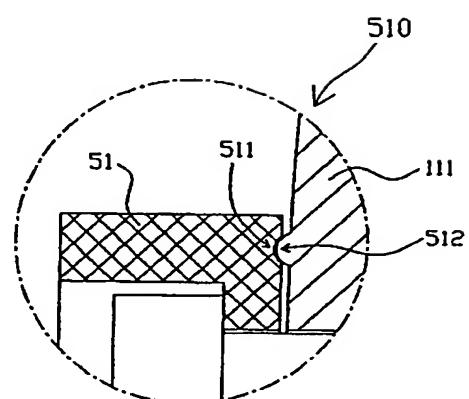
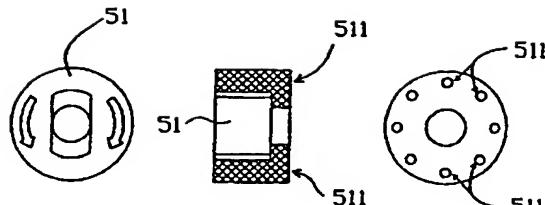
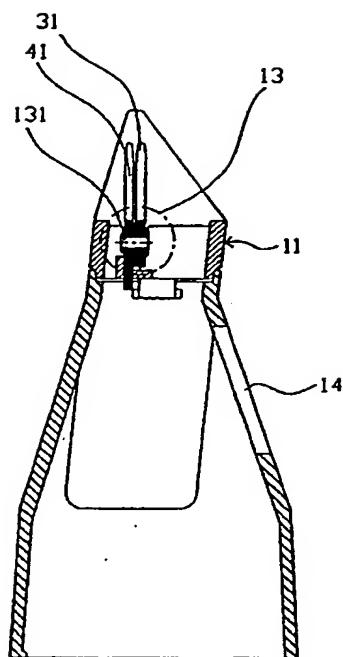


FIG. 4B

FIG. 4A



SECTION B-B

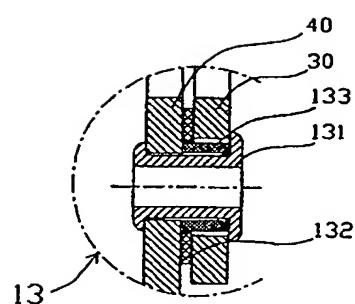
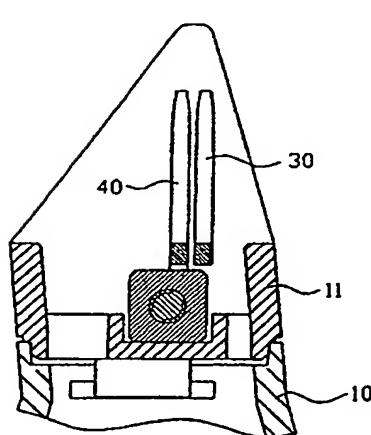
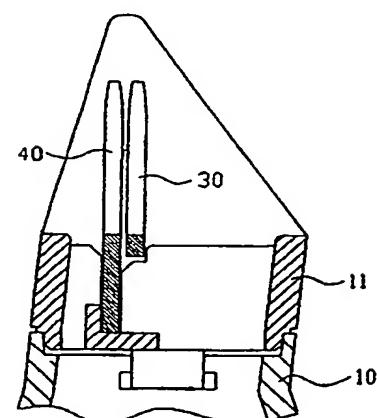


FIG. 5A



SECTION C-C



SECTION D-D

FIG. 5B

FIG. 5C

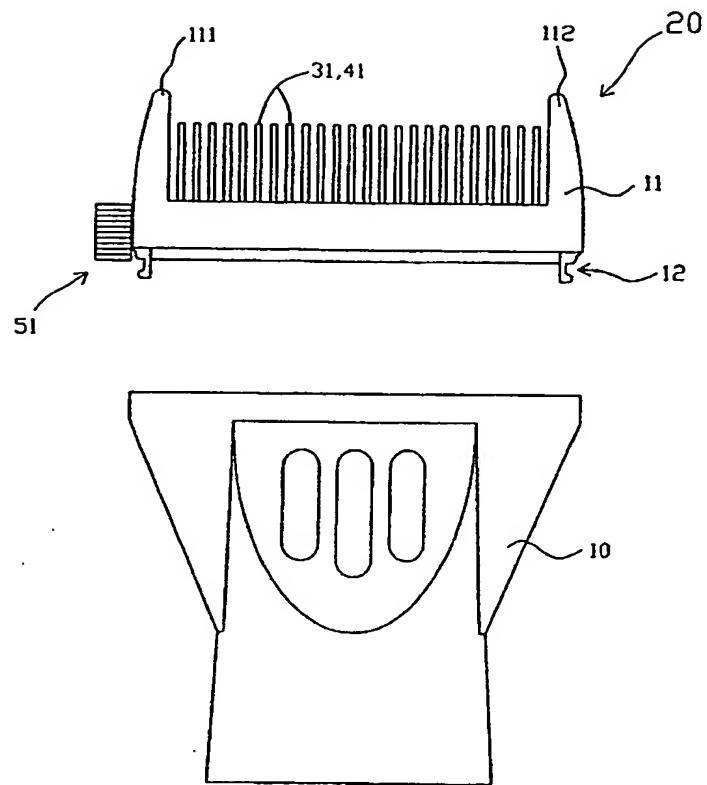


FIG. 6

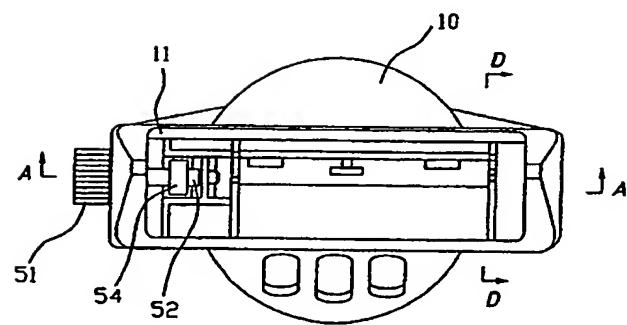
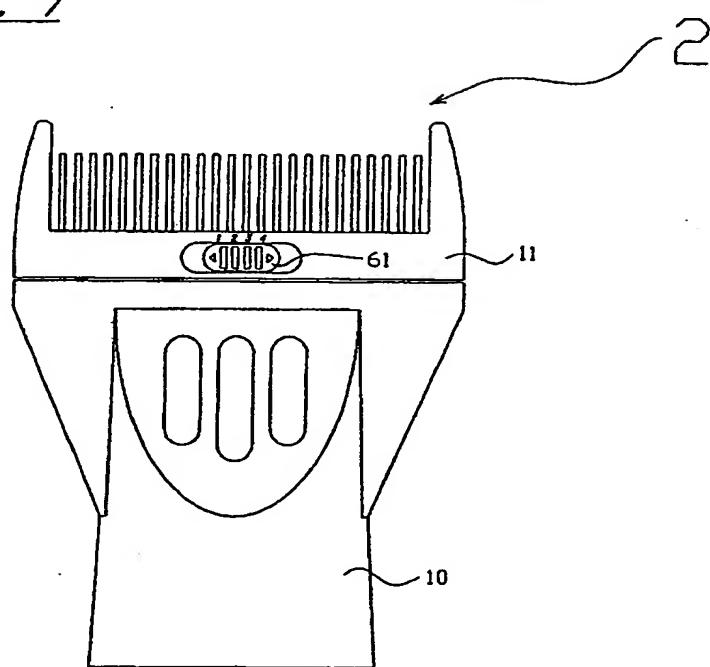
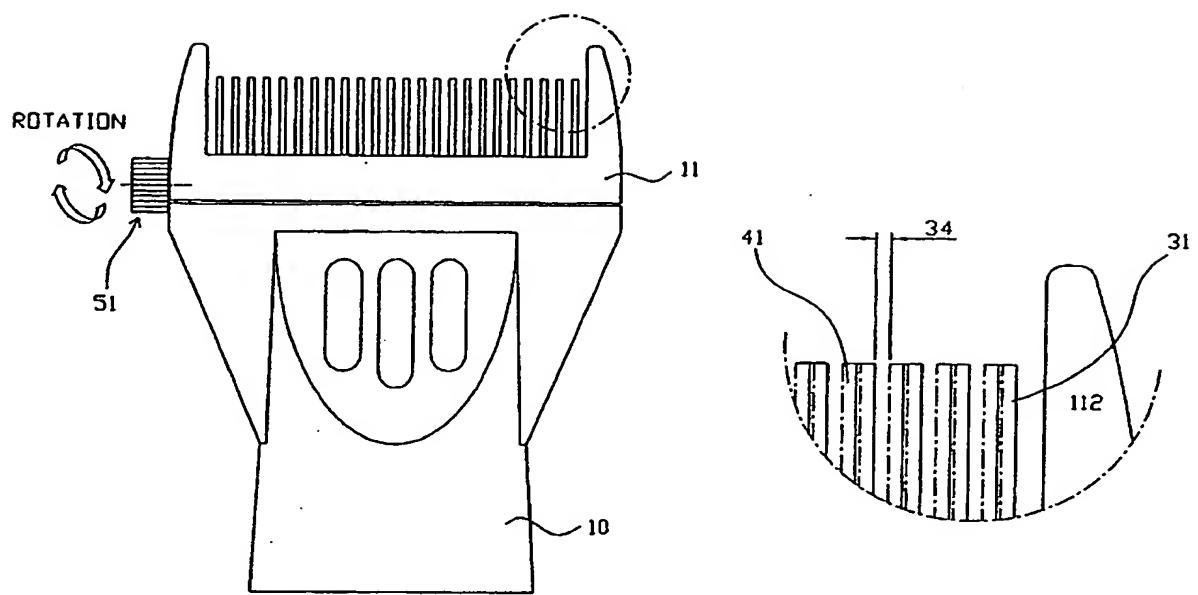
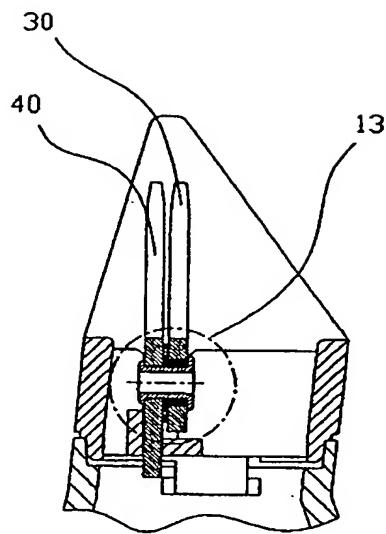


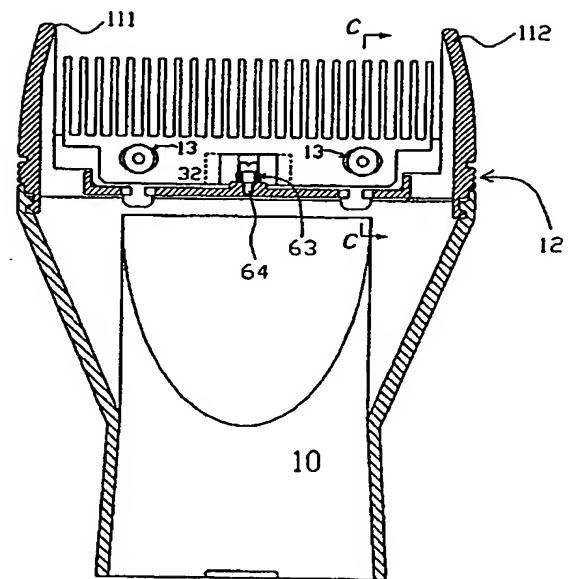
FIG. 6A





SECTION C-C

FIG. 9A



SECTION A-A

FIG. 9

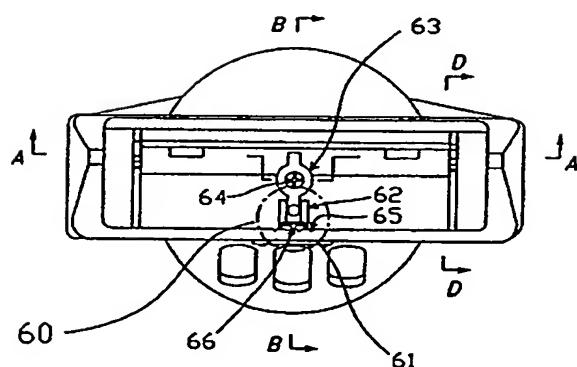


FIG. 9B

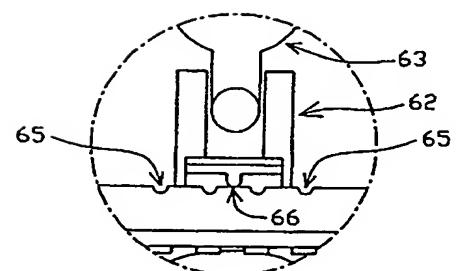


FIG. 9C

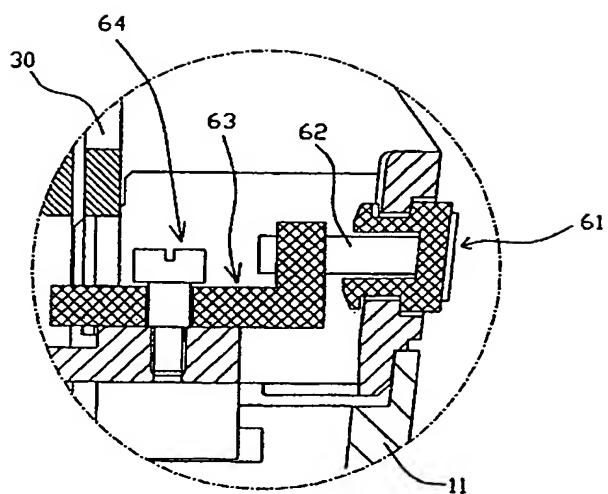
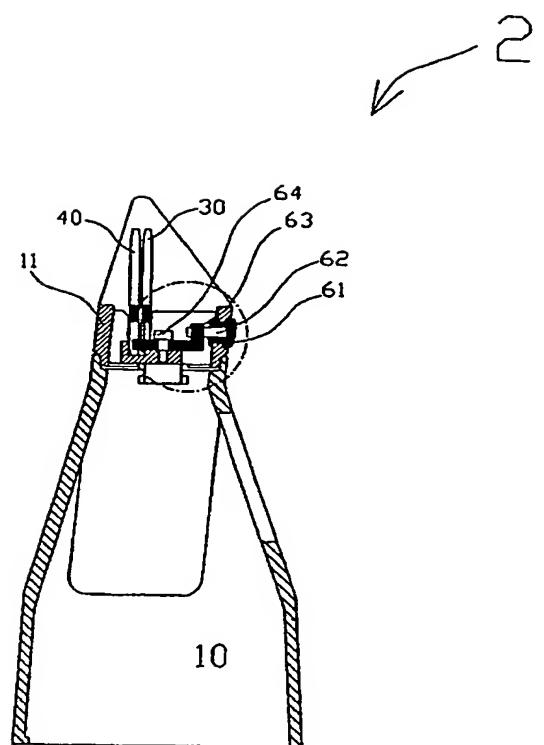


FIG. 10A



SECTION B-B

FIG. 10

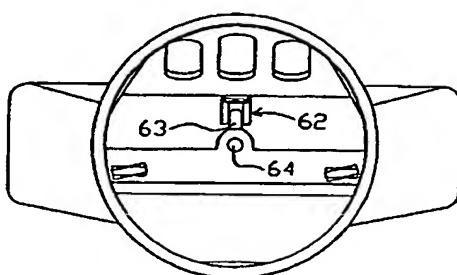


FIG. 11

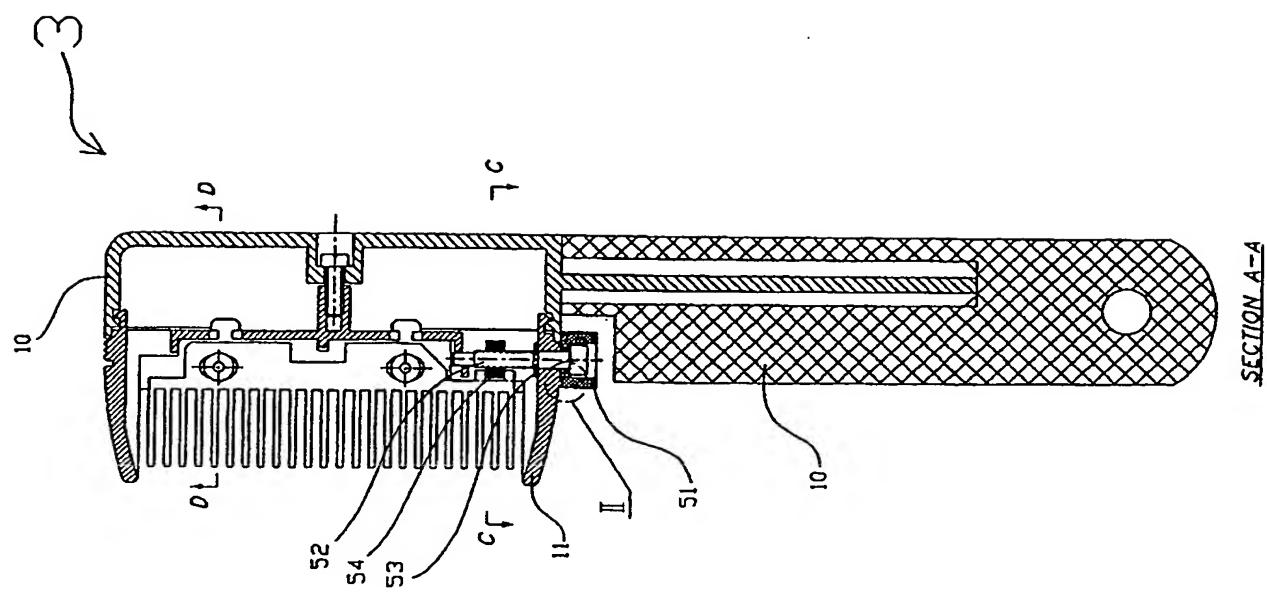


FIG. 14

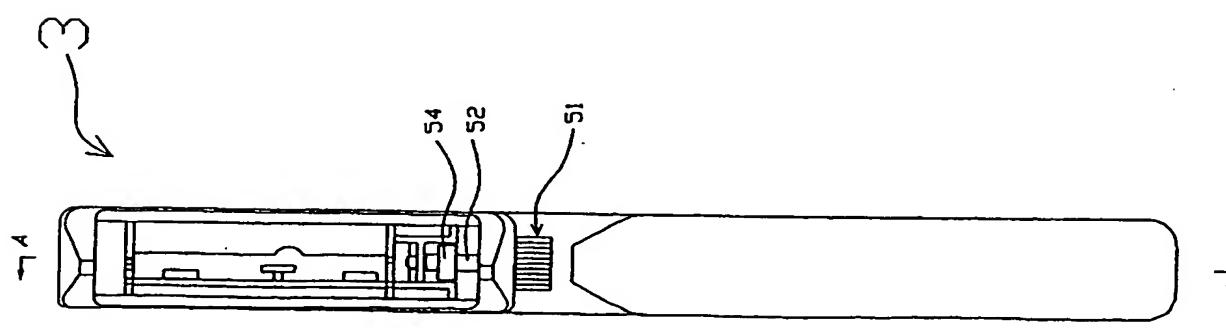
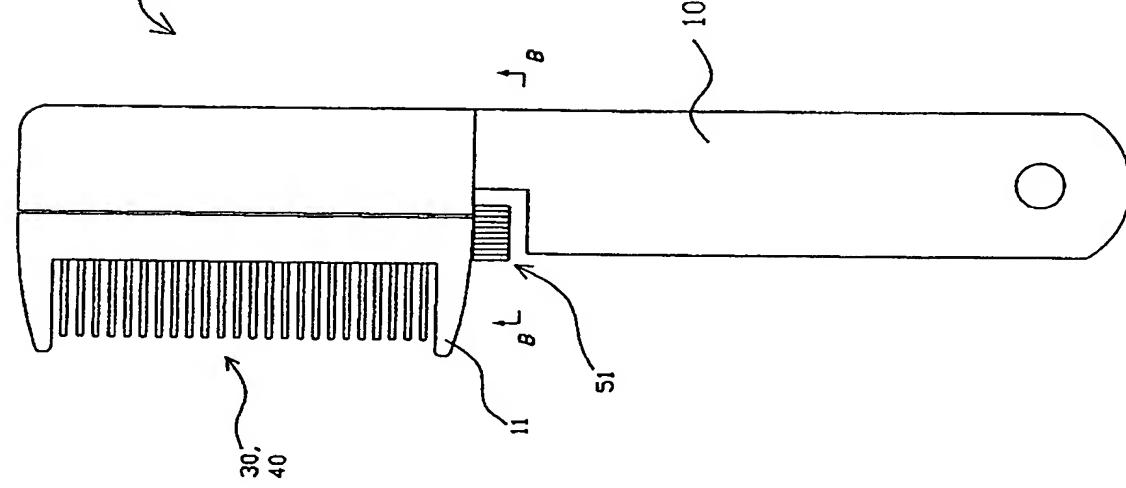


FIG. 12

FIG. 18

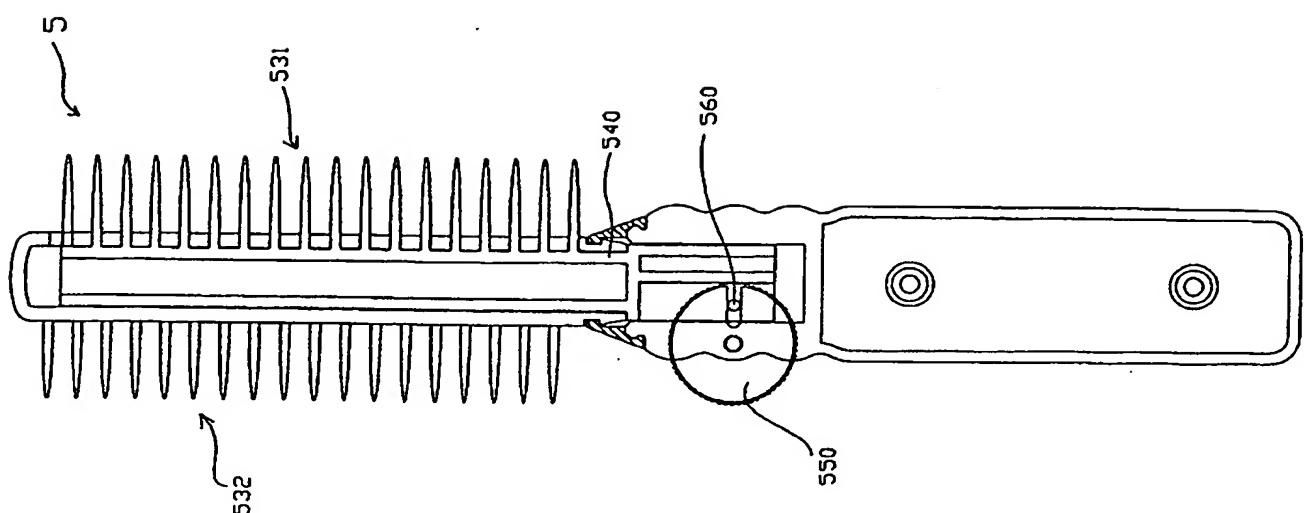
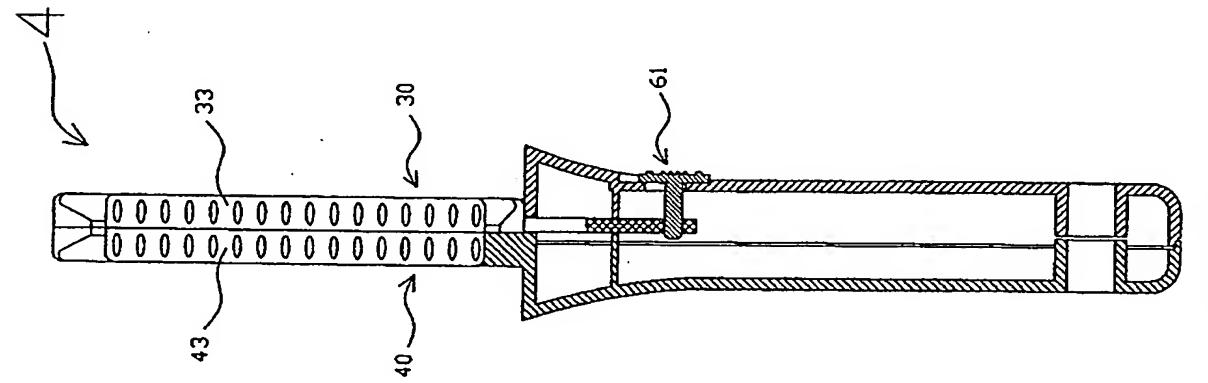


FIG. 17



SECTION A-A

FIG. 16

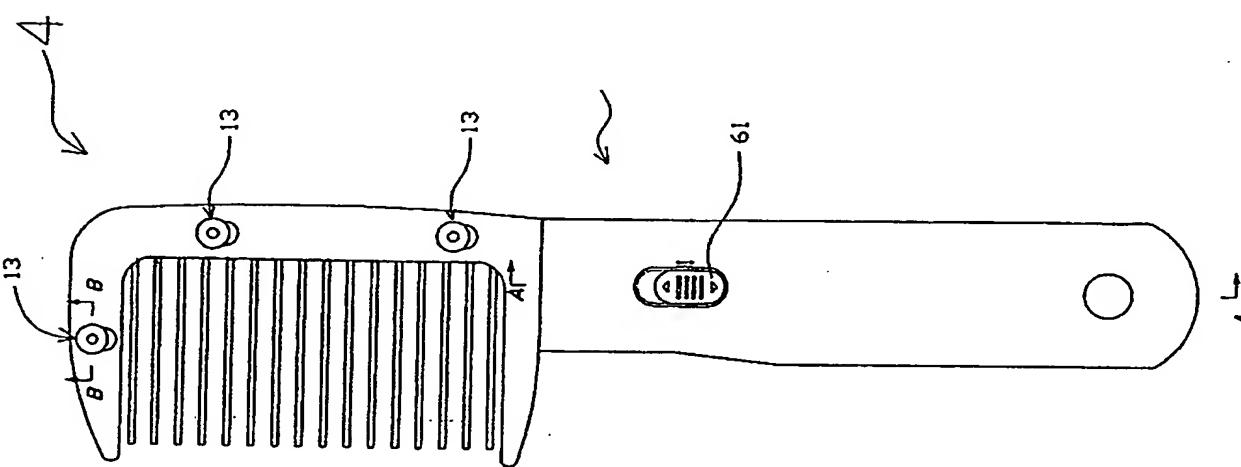
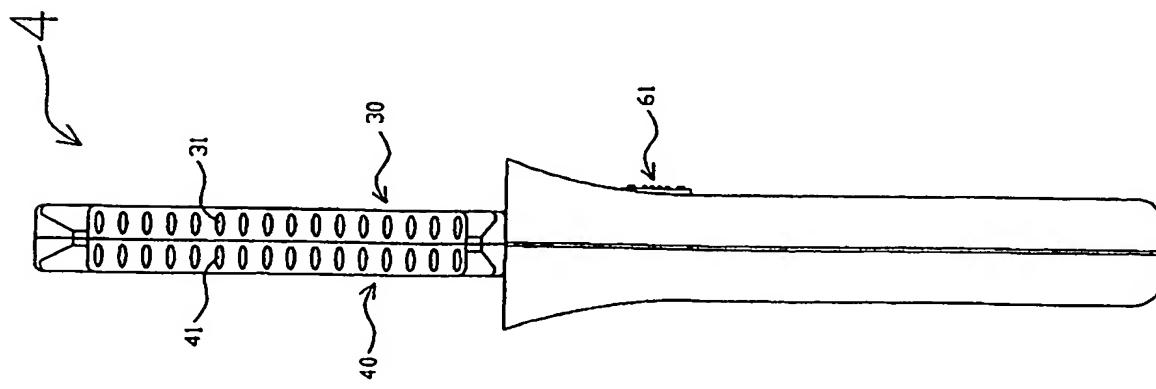


FIG. 15



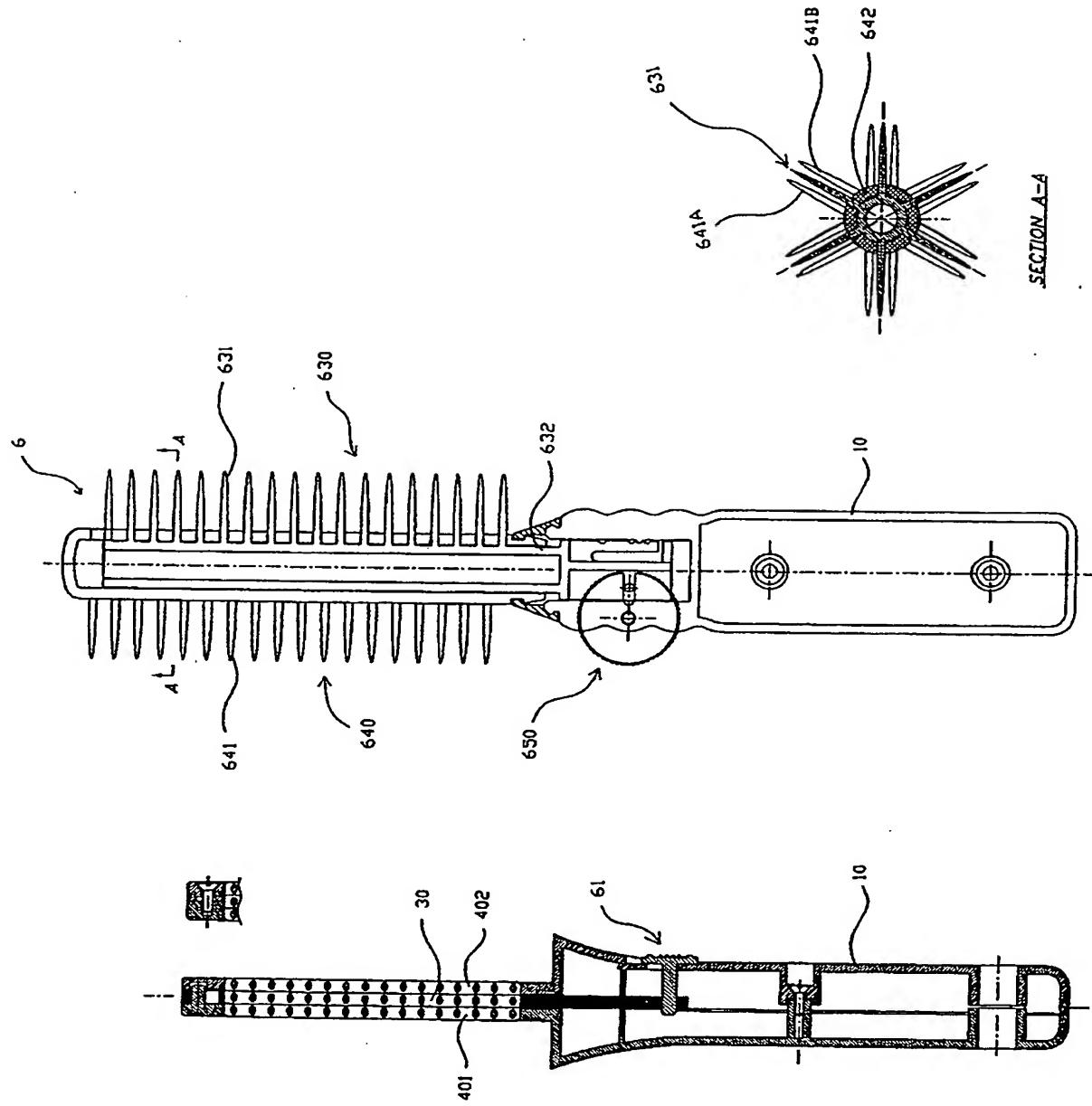
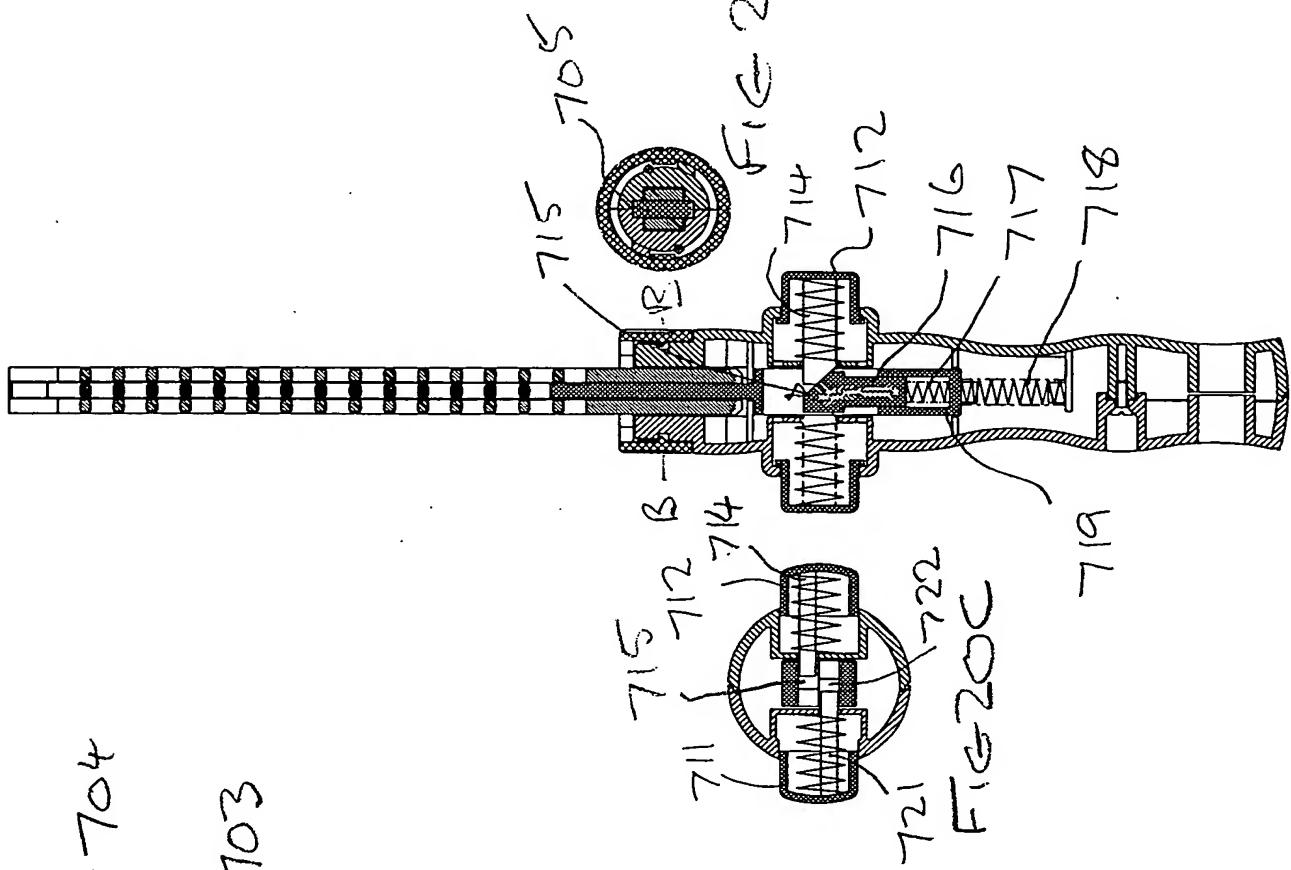
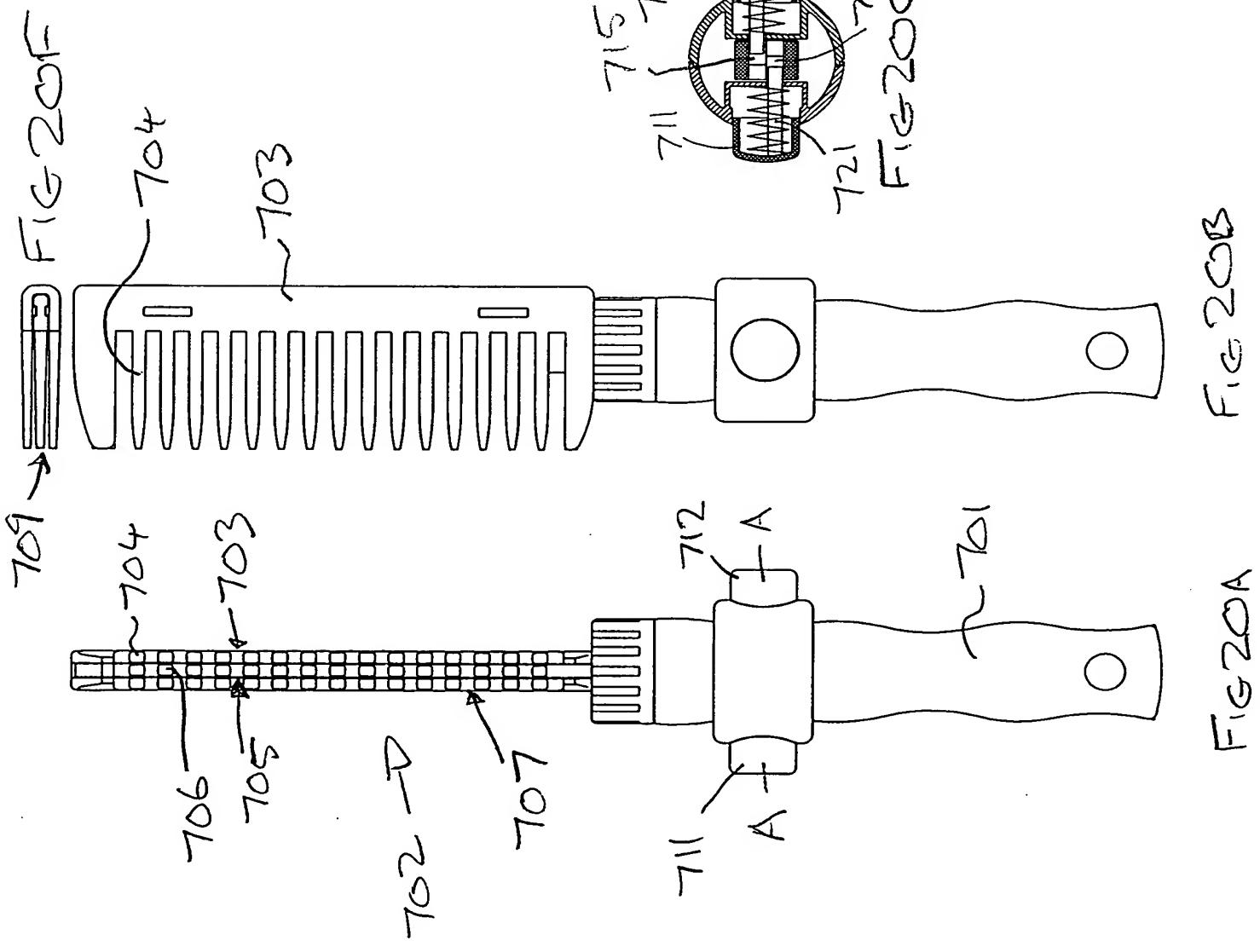


Fig 17A

Fig 19A

Fig 19A

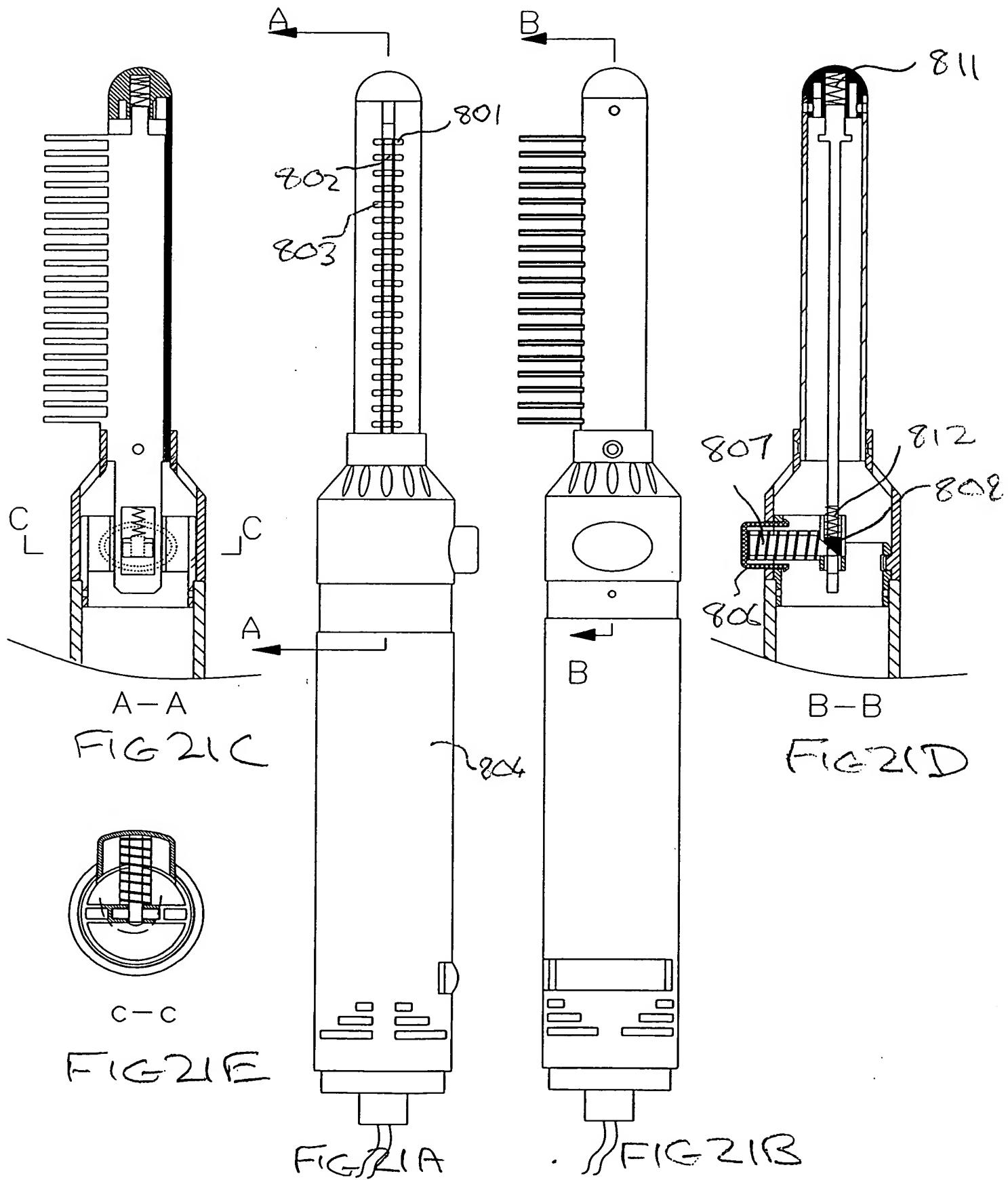


B

FIG 20D

FIG 20B

FIG 20A



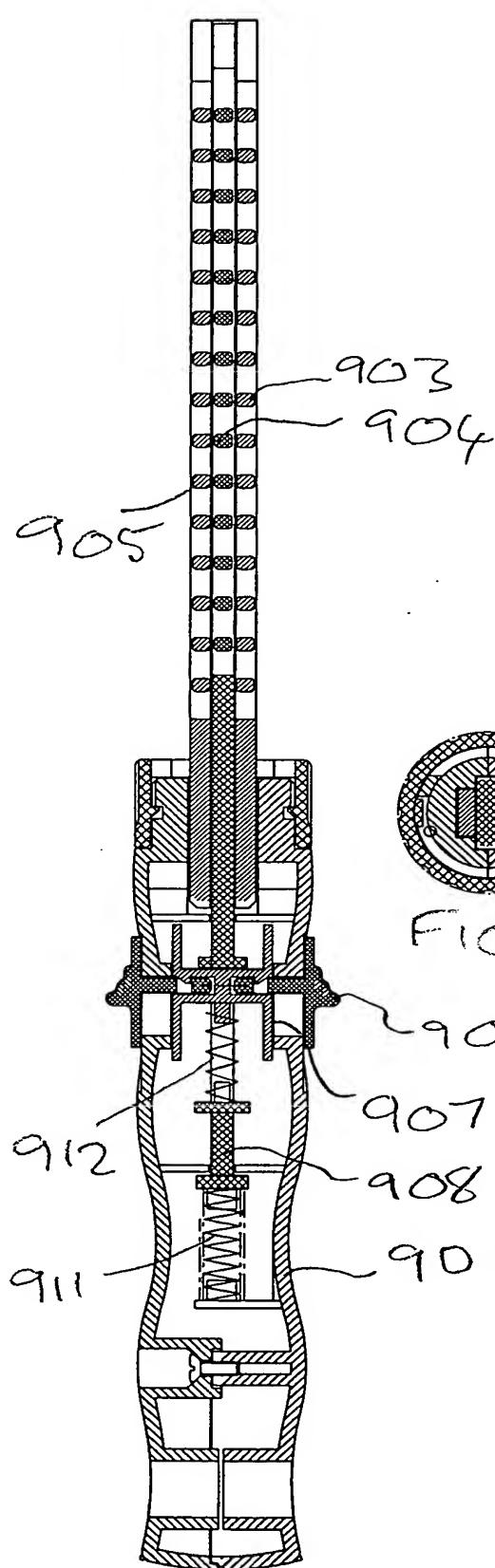


FIG 22A

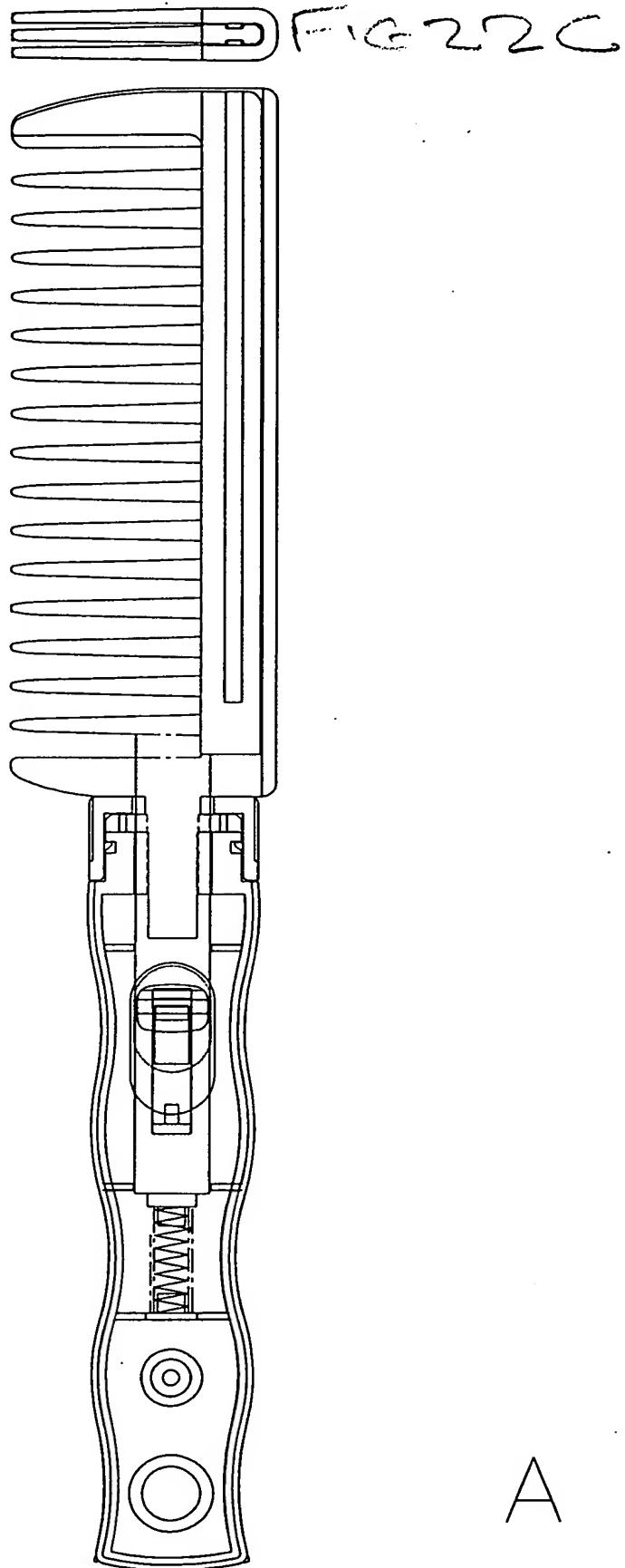


FIG 22B

FIG 22C

## **COMBING DEVICE WITH ADJUSTABLE TEETH SPACING**

### **ABSTRACT**

A hair care device including a main housing, a first comb member, a second  
5 comb member, and teeth spacing adjusting means, each of said first and second  
comb members including a plurality of generally parallel and elongated teeth  
extending from a base portion, said first and second comb members being disposed  
on said main housing such that the elongated teeth on said first and second comb  
members are generally distributed along a first direction and the teeth on said first  
10 and said second comb members generally parallel, said first and said second comb  
members being translatable relative to each other along said first direction, wherein  
the relative translation of said first and second comb members along said first  
direction will cause the elongated teeth on one comb member to transverse the  
space between adjacent teeth on the other comb member to vary the effective teeth  
15 spacing of said device, said teeth spacing adjusting means controls the relative  
translation between said first and second comb members.